```
QQQQQQQQ      ZZZZZZZZZZ    XX       XX
QQQQQQQQQQ    ZZZZZZZZ       XX     XX
QQ      QQ          ZZ        XX XX
QQ      QQ         ZZ          XXX
QQ      QQ        ZZ           XXX
QQ    QQ QQ      ZZ            XX XX
QQQQQQQQQQ      ZZZZZZZZZ     XX    XX
 QQQQQQQQ       ZZZZZZZZZZ   XX      XX
       QQ
```


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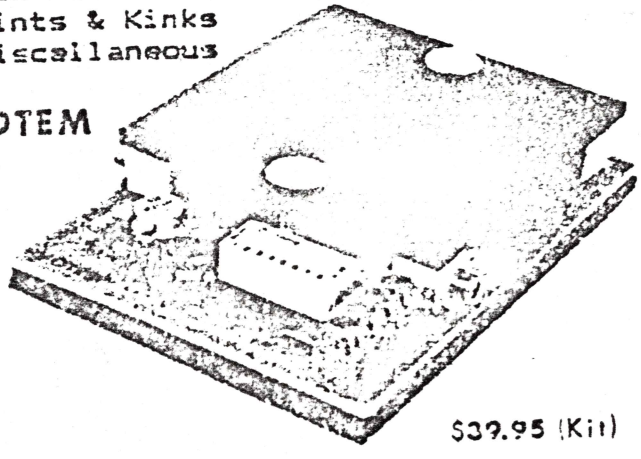
VOTEM



$39.95 (Kit)

ANALOG INTERFACE / TAPE SIGNAL CONDITIONER
(for the Timex/Sinclair Computer)

VOTEM is a complete package consisting of hardware and software that enables your computer to measure, display and record "real world" analog signals. Your computer can monitor any physical phenomenon - pressure, light, temperature, etc., that can be represented by a DC voltage. A probe is provided for air and liquid temperature measurements.

Your computer becomes a "smart" digital voltmeter and thermometer with storage capability. Just think of the possible applications! Use VOTEM and your computer to monitor the temperature in a home energy conservation project to save money and possibly qualify for an energy tax credit.

VOTEM also amplifies and cleans up the tape signal for reliable program LOADing. The tape signal conditioner circuit will allow you to LOAD tapes with a lower volume setting on your tape recorder, resulting in less noise and more dependable LOADs. You will be able to LOAD from tapes which would previously not comply.

VOTEM requires no modifications to your computer and does not use the computer's expansion connector, leaving it free for other add-ons such as the memory pack and printer.

At only $39.95 (assembled and tested), VOTEM is the world's most cost effective analog interface. For an even better bargain the VOTEM kit is only $34.95. (Requires soldering and appx 2 hrs.) VOTEM comes with a detailed 15-page manual. The manual may be purchased separately for $5 and applied to first purchase of a VOTEM unit. If you are not satisfied with VOTEM return within 15 days for full refund. Does not apply to kits.) Send check or money order plus $3 for shipping and handling.

VOTEM: FACTS, FEATURES AND SPECIFICATIONS

VOLTAGE MEASUREMENT PERFORMANCE

Resolution	1.000644V (better than 1% bits.)
Accuracy (note 1)	+/- 0.2%
Input Resistance	250 Megohms
Range (note 2)	0 to +1V (without divider network)
Linearity	0.1%

TEMPERATURE MEASUREMENT PERFORMANCE (specified in degrees C)

Resolution	better than 0.05
Accuracy (note 1)	+/- 0.5
Range	-25 to +125

POWER SUPPLY REQUIREMENTS (note 3)

Operating Voltage	-8V to +15V (unregulated DC)
Current Consumption	25mA (typical)
	15mA without LED

COMPUTER REQUIREMENTS
Timex TS-1000 or Sinclair ZX81. Will also work on ZX80 (w/8K-ROM). Basic measurements and operations require only 1K of RAM memory. Instructions and ZX0 source code driver routine are provided for adapting to any Z80 based computer.

OTHER FEATURES
* Schmitt trigger conditioner circuitry for tape signal.
* LED tape LOAD monitor.
* Buffered audio output for speaker or earphone.
* Can be used as frequency counter from DC to beyond 30KHz.
* Functions are easily selected with 8-pole DIP switch.
* Self-contained in attractive (1" by 3" by 4") enclosure.
* Temperature probe for air and liquid temperature measurements.
* Glass-epoxy circuit board and high quality components used.
* Input connections are reliable miniature screw terminals.
* Instructions for interfacing to any Z80 system with I/O bus input.
* Easy-to-follow, 15-page manual can be purchased separately. $5)

Note 1: All calibration is done in software. The absolute accuracy of VOTEM will depend mainly on the choice of parameters and conversion factors used in the software. If the calibration procedure provided with VOTEM are followed then the accuracy should be as good or better than that specified above.

Note 2: The input voltage range of 0 to +1V can easily be expanded with an on-board resistor voltage divider network.

Note 3: VOTEM can be powered from the Timex/Sinclair computer's power supply. The VOTEM unit contains a power-on and power-one recognition ing also includes the proper connector cable.

Down East Computers P.O. Box 3096 Greenville, N.C. 27834

S A S
Size-Accuracy-Speed

This is the beginning of a new 'column' in which I hope to enlist some (LOTS) of participation. As you know, I am a beginner as far as ZX programming goes, even though I claim to be an 'expert' BASIC and Z80 assembly language programmer. Perhaps a lot of you are beginners such as I and perhaps a lot of you are ZX experts. (I hope so). What I plan to do is introduce a program of some kind (or just an idea when things are slow). Its memory size, the accuracy of its results, and its execution speed will be analyzed. Then I challenge y'all (a Southern expression) to send in improvements to the program. Don't change the basic purpose of the program or delete the 'documentation' REMs to save space, but use all the tricks you know to improve the S A S. I was tempted to rearrange the abbreviations for this column, but censored it to be the SAS column. Some reward will be given to the responses that are definitely a 'winner' and all worthwhile inputs will be printed. Remember we can't compete with the 'big guys' on payments (yet). I hope you like, and participate.

The first program is a simple bubble sort that was developed on the TRS-80 during one of the BASIC courses I conducted. It was written in class by the students and not polished off. After all, the students were just learning what a FOR/NEXT loop was. I converted it for my ZX-81 and played with it quite a while. My findings were interesting. For example, to sort 50 random numbers, (which took 60 seconds on a TRS-80), took 65 seconds (FAST mode) and 395 seconds (SLOW mode). I think the SLOW mode should be renamed the CRAWL mode. To sort a 50 number descending array into ascending order, (which took 76 seconds on the TRS), took 75 (FAST) and 465 (SLOW). The program uses 1274 bytes of memory plus the array storage of ? bytes. Accuracy is not considered in this one, since no arithmetic took place.

Next month(s) I will present similar programs for improved sorting methods. I have one for the Shell-Metzner sort, one called a Quicksort, and one called a recursive Quicksort. Their speeds are much improved over the simple bubble sort, but I challenge you to try to teach them to freshman computer students. Following is a listing of the program. Give it a try.

*** Bo Barry-W4GHV ***

```
  5 REM  BUBBLE SORT DEMO
 10 REM  ON A TRS80 IT TAKES AB
OUT 60 SECONDS TO SORT 50 RANDOM
 NUMBERS AND 76 SECONDS TO PUT A
 50 NUMBER DESCENDING ARRAY IN AS
CENDING ORDER
 100 PRINT "HOW MANY NUMBERS?"
 110 INPUT Q
 120 DIM D(Q)
 125 PRINT "WANT RANDOM OR DESCE
NDING ARRAY (R/D)?"
 130 INPUT Z$
 140 IF Z$="R" THEN GOSUB 1100
 145 IF Z$="D" THEN GOSUB 1000
 150 GOSUB 1300
 200 PRINT
 230 PRINT "START TIMING ME NOW"
 240 LET M=Q
 245 LET YES=0
 250 FOR I=1 TO M-1
 260 FOR J=I+1 TO M
 270 LET COMPARE=COMPARE+1
 280 IF D(I)<=D(J) THEN GOTO 340
 290 LET YES=1
 300 LET SWAP=SWAP+1
 310 LET T=D(I)
 320 LET D(I)=D(J)
 330 LET D(J)=T
 340 NEXT J
 350 NEXT I
 355 IF YES=1 THEN GOTO 245
 357 PRINT
 360 PRINT "I AM DONE"
 370 GOSUB 1400
 375 PRINT
 376 GOSUB 1500
 377 PRINT PEEK (16396)+PEEK (16
397)*256-16530)" BYTES WERE USED
"
 380 STOP
1000 REM BUILDS ARRAY OF DESCEND
ING NUMBERS
1010 PRINT "HERE'S WHAT IM GOING
TO SORT"
1020 GOSUB 1300
1030 LET J=Q
1040 FOR I=1 TO Q
1050 LET D(I)=J
1060 LET J=J-1
1080 PRINT D(I);" ";
1090 NEXT I
1092 PRINT
1095 GOSUB 1300
1099 RETURN
```

```
    ...ILLE A RANDOM ARRAY
    ...INT "HERE'S WHAT IM GOING
TO SORT"
1110 FOR I=1 TO 0
1120 LET D(I)=INT (RND*100)
1130 PRINT D(I);" ";
1140 NEXT I
1145 PRINT
1150 GOSUB 1300
1160 RETURN
1200 FOR K=1 TO 50
1210 NEXT K
1300 LET COMPARE =0
1310 LET SWAP=0
1320 RETURN
1400 PRINT "SWAP'S= ";SWAP,"COMPA
RES= ";COMPARE
1410 PRINT Q;"  NUMBERS WERE SOR
TED"
1420 RETURN
1500 PRINT "HERE'S THE SORTED LIS
T"
1510 FOR I=1 TO 0
1520 PRINT D(I);" ";
1530 NEXT I
1535 PRINT
1536 PRINT
1540 GOSUB 1300
1550 RETURN
```

QSL Printing Program

Here's part of a QSL printing program for the ZX81 and printer. A copy of the first 200 lines is shown here just as it came off the Sinclair printer with a sample of a typical QSL at the top.

The lines shown are the printing lines. Lines 20 to 80 generate the call in large letters using the graphic symbols. The variables in this program were entered in line 290 and following lines.

You will have to program your own data input lines but the QSL sample and program will give you lots of ideas for your own custom card/program. Good Luck. (Thanks ..Ed.)

*** G. Elder-KA0000 ***

KA0000

(QSL CONTINUED)
↓

```
TO RADIO NOET CONFIRMING OUR
21.151 MHZ QSO ON 09/12/82 AT
0103 UTC.  UR RST/RS WAS 599+.
RX/TX HR IS YAESU FT101ZD-100U.
THE ANT IS 3 EL YAGI AT 50 FT.
RX/TX CW DECODE/ENCODE IS VIA
ZX-81 MICRO-COMPUTER.

REMARKS: TNX, DON, FOR FB QSO.

TNX QSL   2917 ELMCREST  73S
          ST. CHARLES, MO
          63301 - USA
```

```
 10 REM "QSL"
 11 REM KA0000, 05.12.82
    G. ELDER
 15 GOTO 290
 20 PRINT AT 0,14;"▗▄▖"
 30 PRINT AT 1,3;"▚▀▜ ▛▀▜ ▛▀▜ ▛▀▜
▛▀▜ ▛▀▜ ▛▀▜"
 40 PRINT AT 2,3;"▌▗▘ ▌ ▌ ▌ ▌ ▌ ▌
▌ ▌ ▌ ▌ ▌"
 50 PRINT AT 3,3;"▛▀▙ ▌ ▌ ▌ ▌ ▌ ▌
▛▀▘ ▛▀▜ ▌ ▌"
 60 PRINT AT 4,3;"▌ ▌ ▌ ▌ ▌ ▌ ▌
▌ ▌ ▌ ▌ ▌"
 70 PRINT AT 5,3;"▘ ▘ ▀▀▘ ▀▀▘ ▀▀▘
▀▀▘ ▀▀▘ ▀▀▘"
 80 PRINT AT 6,9;"  ▗▘"
100 PRINT AT 8,1;"TO RADIO ";A$
;" CONFIRMING OUR"
110 PRINT AT 9,1;B$;" MHZ QSO O
N ";C$;" AT"
120 PRINT AT 10,1;D$;" UTC.  UR
 RST/RS WAS ";E$;"."
130 PRINT AT 11,1;"RX/TX HR IS
YAESU FT101ZD-100U."
140 PRINT AT 12,1;"THE ANT IS "
;F$;" AT 50 FT."
150 PRINT AT 13,1;"RX/TX CW DEC
ODE/ENCODE IS VIA"
160 PRINT AT 14,1;"ZX-81 MICRO-
COMPUTER."
170 PRINT AT 16,1;"REMARKS: ";G
$
180 PRINT AT 19,1;H$;" QSL  291
7 ELMCREST  73S"
190 PRINT AT 20,10;"ST. CHARLES
, MO"
200 PRINT AT 21,10;"63301 - USA
"
```

The Ins & Outs of the ZX-81

This month our survey of the inputs and output of the Sinclair computers will concentrate on the cassette recorder interface.

One of the advantages (and disadvantages) of the Sinclair computers is the cassette tape long term memory system. This system is inexpensive, convenient, slow, and somewhat unreliable. This article will assume that you are completely familiar with the description of the operation of the SAVE and LOAD operations as given in the instruction manual which came with your computer. Here will be given a little more detail of the process so that you can better understand what is happening and perhaps take some steps to improve the operation of

your system.

The basic ideas of long term memory is to store programs in an easily accessable form while the computer is turned off or doing something else. Of course a program listing on a piece of paper will work fine; but, if the program is long, a lot of time will be taken up transcribing it and punching it back into the computer. The tape memory system does all this automatically but only if the form and the content of the program are correct.

One needs to do more than just apply magnetic changes, representing program lines, to a tape. The tape has to remember the computer system variables and the program variables as well as the numbered lines which make up the program. Furthermore, the ZX81 & TS1000 demand that the saved program be given a name; unlike the ZX80 and Micro Ace which did not need names. (Of course, without names the latter two models could not distinguish between programs either).

The ZX81 (and TS1000) puts out a strictly patterned set of signals to represent all the 0's and 1's necessary to represent a program. All this activity is controlled by programs in the 8K ROM.

When the ZX81 SAVE's a program to tape, the first thing it does is write a 5 second silent period. Then it records the name of the program, exactly as you entered it, one byte per character, with the last character inverted (with bit 7 set to 1). Finally it writes the system variables, the program, and the program variables. The display file (the screen display) is also copied to the tape. Each byte is sent to the recorder as eight bits - no start, stop, or parity bits are used - with the most significant bit 7 being sent first. Each bit is represented by a different LENGTH tone on the tape. The details of this representation is given later.

When LOADing a prgram the first thing the computer does is to look for the initial 5 seconds of silence. If such a period is found (with no more than about 5 milliseconds of noise at any one time) the computer measures the length of suceeding signal bursts to decide if they represent 0's or 1's. The first word is always the program name which is compared with the desired name. If the comparison is correct, then each suceeding bit is stored until a byte is collected in a temporary register whereupon the whole byte is transferred to the memory and the process is repeated until the whole program is transferred to RAM. There is a timing circuit which will cancel the LOAD if a 5 ms loss of signal is detected.

The exact details of the signals from a tape recorder depend upon the tape, the recorder, and the measuring instruments. But all signals will have to be somewhat similar to the ones shown on Figure 1 in this article. The signal shown represents an oscilloscope presentation of a 0 followed by a 1. Note that the 0 is exactly four cycles of a 2 kHz tone. The 0 is followed 1.5 ms later by a burst of nine cycles of the 2 kHz tone. This burst represents a 1. The whole tape thus consists of bursts of a 2 kHz tone.

Figure 2, on the same page as Figure 1 shows an expanded view of one of the cycles of this tone burst. Here you can see a little third harmonic distortion and a bit of phase shift which is probably highly dependant on the exact tape recorder used. In fact the whole signal is probably the result of passing a square wave of the basic frequancy through a low pass filter formed by the other components of the system.

The really important features which have been discussed above are the 5 seconds of silence at the start of the program and the 2 kHz tone bursts of two langths separated by 1.5 ms of no signal. Anything (hum, noise spikes, or pops) which would fill in these gaps would cause an incorrect LOAD. The computer also likes the input signal to be above 5 volts peak to peak in amplitude.

With the above features in mind many of the hints given to help save programs make sense. The basic problem is to keep hum and noise out of those places where silence is expected and to keep the length differences between a Ø and a 1 distinguishable. Thus it is suggested that the tape recorder be kept at least a meter away (3 feet is OK) from the TV set and the computer to reduce the possibility of hum pickup. The same reason explains why some recorders work better on batteries than on AC. Some people have found that a metal table helps conduct hum from one piece of equipment to another. (known as humming right along. Ed..)

The suggestion of setting the treble controls to maximum makes sense because that setting favors the 2 kHz signal and discriminates against 6Ø Hz hum. One must also set the volume control high enough so the computer gets the required 5 v signal but not so high that the recorder distortion blurs the time distinction between the Ø's and 1's. Another tip is that reused tapes be bulk erased to keep the background hiss as low as possible.

There is still a lot to be learned about the tape recorder connection. I have not yet said anything about the output or input impedances or anything about how these signals are generated in software. Nor have I said anything about using these signals for any other purpose. (CW, music, etc) These items will have to wait for another month. We encourage all of you who have experimented with the cassette I/O to send in information you have learned. Anyone have a machine language routine to do cassette I/O? Lastly, when having problems, degauss the recorder head and clean with isopropyl alcohol. Radio Shack sells a suitable degausser I think. How about an article for use of the LED bar-graph type display for monitoring input audio levels?

*** Alex Burr-KEXY ***

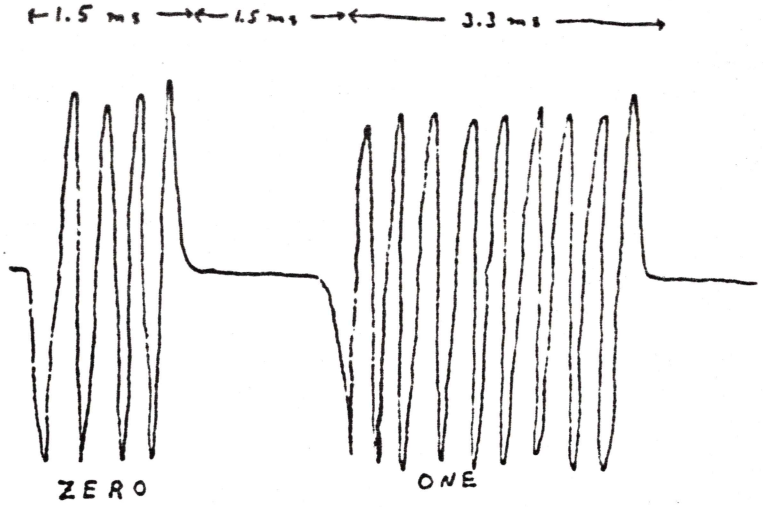


FIG. 1 SIGNAL FROM TAPE RECORDER

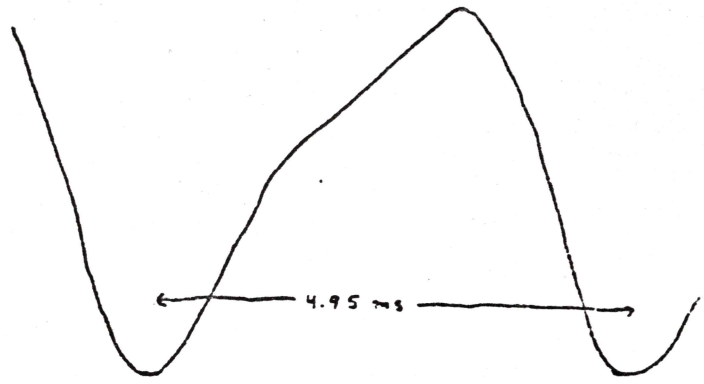


FIG. 2 AN EXPANDED VIEW OF ONE CYCLE

Log Keeping Program

Here's a useful log keeping program printed on the new MW-1Ø printer. (Also, see the mini-review of this printer in the reviews-next issue. Thanks Bob..Ed.)

*** Bob Howard-WA6DLI ***

```
   1 REM E0RND F
RET AT S  T GOSU
E PI FAST AT TAN

  10 REM *LOG KE
EPER*
  20 DIM A$(230,
50)
  30 DIM H$(1,10
)
  50 FOR X=1 TO
230
  51 CLS

  52 PRINT "QSO.
 ";X;"  (BYTES R
EMAINING ";USR 1
6514;")"
  54 PRINT

  55 LET T=0

  56 PRINT

  57 PRINT

  60 PRINT "CALL
 SIGN? ";
  70 INPUT B$

  75 IF LEN B$>=
2 THEN PRINT B$
  80 IF B$= "S"
 THEN GOTO 1000
  90 LET A$(X,1
TO 10)=B$
 100 PRINT "DATE
 ?";
 110 INPUT A$(X,
11 TO 16)
 120 PRINT A$(X,
11 TO 16)
 130 PRINT "UT T
IME ?";
 140 INPUT A$(X,
17 TO 20)
 150 PRINT A$(X,
17 TO 20)
 160 PRINT "METE
R BAND ?";
 170 INPUT A$(X,
21 TO 22)
 175 IF LEN A$(X
,21 TO 22)>3 THE
N GOTO 160

 180 PRINT A$(X,
21 TO 22)
 190 PRINT "MODE
 ?";
 200 INPUT A$(X,
27)
 210 PRINT A$(X,
27)
 220 PRINT "REPO
RT ?";
 225 INPUT A$(X,
34 TO 36)
 230 PRINT A$(X,
34 TO 36)
 231 PRINT "NAME
 ?";
 235 INPUT A$(X,
27 TO 36)
 234 PRINT A$(X,
27 TO 36)
 236 PRINT "OTH/
REMS : ";
 237 PRINT

 238 INPUT A$(X,
37 TO 50)
 239 PRINT A$(X,
37 TO 50)
 240 PRINT "ALL
OK? (Y/N)"
 241 INPUT O$

 242 IF O$="N" O
R O$="NO" THEN L
ET A$(Z,1 TO 30)
=""
 243 IF O$="N" O
R O$="NO" THEN C
LS

 244 IF O$="N" O
R O$="NO" THEN G
OTO 53

 245 NEXT X

1000 CLS

1010 PRINT  "SEA
RCH MODE ENTERED
 TYPE: "

1020 PRINT "
C FOR CALLSIGN S
EARCH"

1030 PRINT "
N FOR ""NAME"""
1035 PRINT "
R FOR RUBOUT ""C
ALL"""

1040 PRINT "
D FOR DATE SEARC
H     "

1021 PRINT "PRES
S ""Q""TO EXIT PR
OGRAM"

1040 INPUT Z$

1042 LET T=0

1045 CLS

1050 IF Z$= "C"
 THEN GOSUB 3000
1055 IF Z$="N" T
HEN GOSUB 4000
1057 IF Z$="N" T
HEN GOSUB 4500
1060 IF Z$= "D"
 THEN GOSUB 3000
1061 IF Z$= "X"
 THEN STOP
1062 PRINT

1065 IF T>=2 THE
N CLS
1070 PRINT "RETU
RN TO ENTRY MODE
"

1071 PRINT

1080 GOTO 53

2000 PRINT "ENTE
R CALL SIGN FOR
SEARCH";

2010 INPUT H$(1)

2025 PRINT AT 0,
0;"THESE QSO""S
FOUND FOR THE CA
LL:"
2026 PRINT H$(1)

2027 PRINT

2030 FOR Z=1 TO
X
2035 IF H$(1,1 T
O 10)=A$(Z,1 TO
10) THEN GOSUB 5
000
2038 IF H$(1,1 T
O 10)=A$(Z,1 TO
10) THEN LET U=0

2040 NEXT Z

2042 IF U=1 THEN
 PRINT H$(1);" N
OT FOUND"

2050 RETURN

3000 PRINT "ENTE
R DATE FOR SEARC
H";

3010 INPUT H$(1)

3020 PRINT H$(1)

3022 LET T=0

3025 PRINT AT 0,
0;"THESE QSO""S
FOUND FOR THE DA
TE"

3030 FOR Z=1 TO
X
3035 IF H$(1,1 T
O 6)=A$(Z,11 TO
16) THEN GOSUB 5
000
3040 NEXT Z

3041 IF T>=1 THE
N GOTO 3045
3042 IF T=0 THEN
 PRINT "NO ACTIV
ITY FOR ";H$(1)

3045 PAUSE 600

3047 IF T>=2 THE
N CLS
3050 RETURN

4000 PRINT "ENTE
R CALLSIGN OF QS
O"

4001 PRINT "TO B
E DELETED:"
4010 INPUT H$(1)

4020 PRINT ;H$(1
)
4030 FOR Z=1 TO
X
4040 IF H$(1,1 T
O 10)=A$(Z,1 TO
10) THEN GOTO 70
00
4043 NEXT Z

4050 RETURN

4500 PRINT "ENTE
R NAME OR ""HAND
LE""  TO  BE  S
EARCHED"
4510 INPUT H$(1)

4520 PRINT H$(1)

4530 FOR Z=1 TO
X
4535 IF H$(1)=H$
(Z,27 TO 36) THE
N GOSUB 5000

4549 NEXT Z

4550 IF T>0 THEN
 PAUSE 600
4555 IF T>=2 THE
N CLS
4560 RETURN

5000 PRINT

5002 LET T=T+1
```

```
...NT "DATE
...E 11 TO 18
...A$(Z,17 TO
14 )" ;A$(Z,15
TO 16)

5010 PRINT "TIME
 ";A$(Z,17 TO 18
);":";A$(Z,19 TO
 20)
5030 PRINT "CALL
SIGN:";A$(Z,1 TO
 10)

5030 PRINT "BAND
 ";A$(Z,21 TO 22
)

5040 PRINT "MODE
 ";
5050 IF A$(Z,23)
="C" THEN PRINT
 "CW"

5060 IF A$(Z,23)
="S" THEN PRINT
"SSB"

5070 IF A$(Z,23)
="T" THEN PRINT
"RTTY"

5080 IF A$(Z,23)
="F" THEN PRINT
"FM"

5090 IF A$(Z,23)
="V" THEN PRINT
"SSTV"

6000 PRINT "REPO
RT ";A$(Z,24 TO
30)
```

```
6005 PRINT "NAME
 ";A$(Z,27 TO 3
0)

6007 PRINT "CITY
FROM ";A$(Z,27 T
O 30)

6008 LET U=NOT 0

6010 PRINT

6011 IF T>=2 THE
N PAUSE 600
6012 IF T>=2 THE
N CLS
6013 IF T>=2 THE
N LET T=0
6015 RETURN

6016 STOP

7000 LET G$=A$(Z
,1 TO 10)
7001 PRINT

7002 PRINT

7010 PRINT "DON
NO ";Z;" DELETED
"

7015 IF G$=A$(Z,
1 TO 10) THEN LE
T A$(Z,1 TO 16)=
""
7020 LET Z=Z-1

7030 GOTO 4050

7050 SAVE "LOG K
EEPER"
7060 GOTO 53
```

screen copy "Big Letter program"

WA8OLT

BOB

HOWARD

ZX-81/TS-1000 Direct Video Output

The direct video output modification for the ZX-81/TS-1000 will provide a clear, sharp video display on any video monitor or on a TV set modified for direct video as described in Don Lancaster's 'Cheap Video Cookbook'. The diodes (see schematic) provide the bias offset for driving the video amplifier in the TV set.

CAUTION Only use this connection if your TV set has a transformer in its power supply, most small portable sets do not. Alternatives are to use an AC isolation transformer or optoisolators for coupling the video and sync signals. This circuit also has a built-in provision for reversing the video so you can obtain either black letters on a white background as is normal or white letters on a black background which I find more pleasing.

The circuit can be built small enough to fit inside the ZX-81 case and the video connection is made by twisted pair lines to pin 16 of the logic chip (IC1) which is also connected to D9 and R29. A switch or jumper can be provided to give 'normal' or 'inverted' video and the RF signal should be brought out with a small diameter coax cable such as RG-174U. My cable goes to a minature phone plug which plugs into a closed circuit minature jack on my 12" B&W TV so I can switch from TV to video monitor mode by merely plugging the cable into the TV set.

*** Josh Cockey-W4MHQ ***

3-Port I/O board

for Microace,
ZX-80,81
16K RAM
edge connector

Programmable 8255 P.I.A. can be configured for direct I/O; polling of peripheral devices.

Use it with A/D converters, serial I/O port chips, relays, sensor inputs, clock chips, or a security system.
Play chimes with different tunes using your computer.
8080 M/L programs, TRS-80 M/L programs will work.
Literature available with experiments, programs, and information on how to use the 8255 P.I.A.

Basic 8255 board $50
add-ons extra

Professional Electronics
109 CHESNEY LN COLUMBIA SC 29209

PRINTER INTERFACE

CENTRONICS STYLE PARALLEL PORT PRINTER INTERFACE ENABLES USER TO PRINT ALPHANUMERICS, AND SELECTED GRAPHICS SYMBOLS USING THE 8K-16K ZX-80, ZX-81, OR TIMEX 1000 WITH THE AXIOM GP-100A PRINTER.

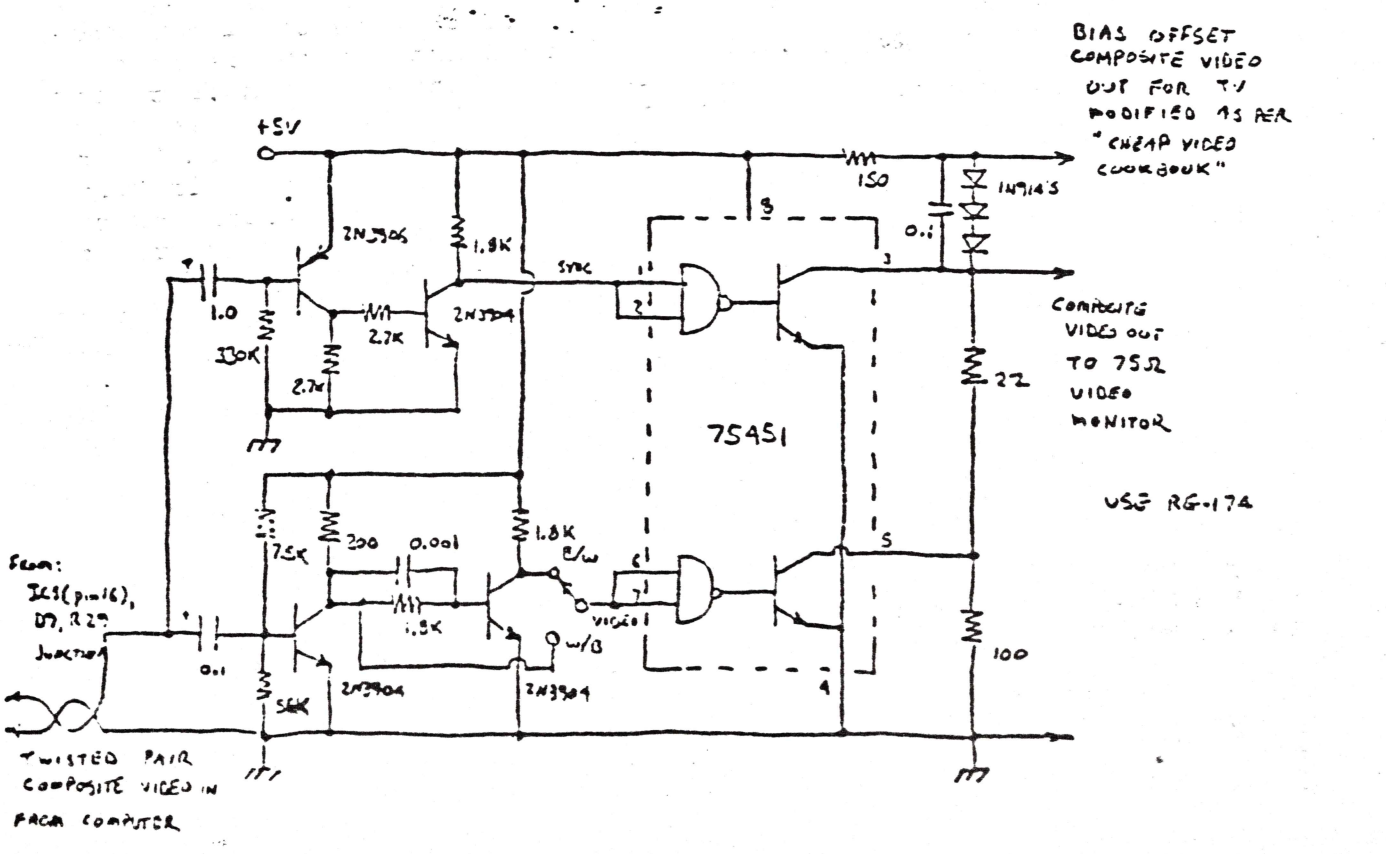
(Also compatible with other Centronics Standard Printers.)

PRINTER COMMANDS AND M/L PROGRAMS ARE STORED IN AN 8K MEMORY AREA NOT USED BY COMPUTER. PROGRAMS ALLOW PRINTOUT OF LISTINGS, SCREEN DISPLAYS, M/L CODE, TEXT-32 COLUMNS FOR LABELS, WIDE LETTERS, ETC., OR 63 COLUMNS WIDE FOR LETTER-SIZE PAPER.

SPECIAL BASIC PROGRAMS CAN BE STORED IN 2K CMOS RAM FOR INSTANT RECALL.

CASSETTE PROGRAMS, I/O BOARD (SEE LEFT), **EXTRA 8K ROM BOARD WITH 2K ROM AND 2K CMOS RAM**, AND WITH COMPLETE INSTRUCTIONS----------$135

CUSTOM PROGRAMMED 2K ROMS----------$15



ZX-81 DIRECT VIDEO OUTPUT
FOR VIDEO MON OR MODIFIED TV

11/20/82 WAMHG

THE AMSAT AMS-81 PROJECT

Supplying the requirements for scheduling and tracking PHASE IIIB has become the priority objective for the AMS-81 project team. OSCAR operators have become almost universally proficient with using PROJECT OSCAR type orbital predictions in conjunction with OSCARLOCATOR type polar plotters. Unfortunately, these methods will not work for the highly elliptical PHASE III type orbit. A more sophisticated means to produce required information will be required, and we have chosen the Sinclair ZX-81/Timex Sinclair 1000.

Two independent software efforts are currently underway to produce a scheduling and tracking program which will run in a 16K expanded machine. Completed software will be audited by several OSCAR operators with a mix of operational and tracking experience. The final result(s) will be professionally copied and made available through AMSAT volunteers in plenty of time for the PHASE IIIB launch. This software will also be usable with shortlived PHASE II type missions such as ISKRA 3 or STS.

Simultaneous to the above, but on a slightly longer schedule, a hardware project is underway to develop an automatic tracking capability based on the same computer. This accessory hardware package will contain a realtime clock, digital-to-analog convertion for AZ-EL rotor control, an ASCII RS-232 interface and a plug-on port for standard 16K memory packs. Specific devices to implement these features have been selected and the hardware is currently under construction. The completed assembly and associated software will provide fully automated realtime tracking of PHASE II and III satellites.

AMSAT is undertaking these projects to ensure that individual operators have the ability to schedule PHASE III operating periods and produce tracking information. AMSAT will regularly supply Keplarian data to be input to these programs just as EQX data is supplied for PHASE II satellites today. Additional information will be forthcoming from project management.

*** Ralph Wallio - WØRPK ***

Unclassified

WANTED: Subscribers for the fastest growing newsletter for Sinclair computer/radio amateurs. Subscription cost is only $12 for 12 guaranteed issues.

WANTED: Articles for use in QZX. Budgetary limitations at present limit payment (for articles used) to extension of paid subscriptions by one issue for each major article printed.

WANTED: Unclassified ads for publication in QZX. Cost is 1 cent for each keystroke (characters, blanks, etc). Payment must be included with order. This is an excellent way to sell your unwanted equipment, ask for help, find a specific program, etc. Send your ad in with payment to QZX, 2023 O' Donnell, Las Cruces, N.M. 88001.

FREE: Bearcat scanner program. K2MI, Marty Irons, 46 Magic Circle Drive, Goshen, N.Y.,10924 has a 60 line program (8K ROM, 4K RAM) which will generate Bearcat 101 scanner switch settings for any band/frequency. He is offering this program to any QZX reader who sends a self-addressed stamped envelope requesting SC-101. (Tnx Marty)

MISC: Sinclair has a toll-free 800 number for technical problems. It is 800-832-9534.

MISC: Timex also has one for computer-related problems. (no calls on your sick watches!). It is 800-248-4639.

MISC: If you are thinking of buying the Double H Electronics keyboard (see ad in previous issue) better hurry up, they are almost out of them.

FOR-SALE: SWR program- enter up to 10 frequencies and power readings. Calculates and plots SWR on a bar graph. 8K/16K cassette $6.00+ $1.50 Shipping. Send to K5MIL, 2905 Prescott, Garland, Tx.,75041.

FOR-SALE: Toll:free telephone numbers for suppliers of computer, electronics, and amateur radio equipment. Why spend hours hunting through magazines when you can have over four hundred 800 numbers all together? $2.00 from Martin Irons, 46 Magic Circle Dr., Goshen, N.Y.,10924

FOR-SALE: Final closeout of back issues of 'QZX' from Aug 81 to Jun 82. Five exciting issues with ham programs and schematics. Only a few dozen sets left. $5.00 per set from Martin Irons, 46 Magic Circle Dr., Goshen, N.Y.,10924.

FOR-SALE: Machine language buffs- Announcing "DA1", a true 8K/16K Z80 ROM/RAM disassembler. No external table lookups required. Browse through Sinclair's powerful machine code or through your own. Tape/instructions for $9.00 from Martin Irons, 46 Magic Circle Dr., Goshen, N.Y., 10924.

FOR-SALE: Mailing labels with addresses of Sinclair/Timex hardware/software suppliers. Over 120 addresses for $1.20 + SASE (business size) with 54 cents postage. Same deal for labels with YOUR address on them. W4GHV, 1967 Defiance Ave.,Las Cruces, N.Mex.,88001.

Products in Review

This column will provide reviews of hardware 'add-ons', software, and books that are available for the Sinclair computers. Again, we will do reviews as our budget allows, or as they are loaned/donated by vendors for review. Reviews done by our subscribers will also be welcomed. 'First in line' are two excellent reviews received from Josh Cockey, W4MHQ.

These reviews cover two superb software products written by Ray Kingsley of SINWARE, Box 323, Dixon, N.Mex.,87527. They are HOT Z, which was first introduced in the spring of '82 and Z EXTRA later introduced in the fall. Both are machine language utilities and sell for $19.95 each.

HOT Z is a machine language disassembler and editor which will run on any ZX-80 (with the debugged floating point ROM), ZX-81 or TS-1000 with 16K or more of RAM. (Specify your system when you order, there are versions to compensate for the ZX-80 & more than 16K RAM.) The

program itself uses 9.25K. HOT Z assumes a knowledge of Z-80 machine language but has sufficient documentation (>40 pages) to lead even a novice programmer through the initial stages. A Z-80 assembly language handbook, such as the one by Zaks published by SYBEX and sold by Radio Shack is a desirable accessory. HOT Z is NOT an assembler but can be used to write, edit, and debug machine language programs. It can be used to disassemble itself, the ROM, or any other machine language program in memory and it can be customized to suit the individual user.

Memory contents can be displayed in hexidecimal, decimal, and character code form. The disassembled listings show the hex address, hex contents, address 'NAME' and the Z-80 mnemonic listing. Z-80 register contents can be displayed and there is provision for single stepping through a program for debugging purposes. There is a set of user definable labels (NAMEs) for addresses which can be used as is, altered to suit, or completely redefined. The NAMEs allow relative addressing by NAME rather than by address or displacement, which greatly simplifies writing programs.

The documentation supplied with many software packages leaves a lot to be desired. (I second that..Ed..) Not so with HOT Z. It is complete and well written and the introductory section leads you by the hand through the many features of the program, a definite boon to novice programmers. Anyone who has an interest in writing or reading machine language programs for the ZX-80 will find this program on his indispensible tool list. It is far superior to anything else on the market. (Sure wish it had an ASSEMBLER! ..Ed..) HOT Z was also reviewed in the premier issue of SYNTAX QUARTERLY and in the Nov/Dec 82 issue of SYNC.

Z EXTRA is a display management program written in machine language occupying 8K. It requires the use of slow mode so will not run on an unmodified ZX-80. It comes with a 17 page instruction manual plus a keyboard reference sheet labeled to indicate key functions for the various modes of operation. The program adjusts for your memory size up to 64K. Z EXTRA cannot be listed but if you have 32K or more of RAM, you should be able to modify it if need be by using HOT Z.

Pages of video display called 'SCREENS' can be CREATED using the WRITE (for text) or DRAWing (for pixel graphics) modes. Text can be written in normal or expanded (4X or 8X) size and text and graphics can be intermixed on any screen. Ten or more screens can be created in 16k of memory (the max number depends on screen content) and 55 or more can be created if you have 64K of RAM.

Once you have the screens in memory, they can be saved in a cassette file for future use. You can DUPLICATE, REVISE, DELETE, SEARCH THRU, INSERT, EXCHANGE, or otherwise EDIT the screens. Extensive cursor control and other features are provided for ease of editing screens. You can also PRINT them if you have a printer. When you are ready for display, you can display any screen or sequence thru selected screens at a user selected rate or scroll through them vertically or horizontally (the latter at normal or 4X expanded size). Using another program supplied with Z EXTRA called ZEXBAS, you can use the screens you have created within BASIC programs for titles, background, or whatever.

The obvious application for amateur radio is for displaying your call or other pertinent information about your station on ATV. Since the program can be used as a programmable bulletin board, my initial use was to display info about our club at a demo held at a local shopping mall. The screens I used include a title page, general info about amateur radio, our club, our repeater and a plug for our next novice licensing class. It should also prove to be useful as an instructors aid for theory classes. (How about businesses using it for commercials in window displays? Ed..)

Response from SINWARE is very prompt. When I had a problem with my Z EXTRA tape, I received a replacement in the mail within a week. I highly recommend either or both programs to anyone having a

need for the capabilities they provide. 73, Josh Cockey, W4MHQ, Rt. 2, Box 239, King George, Va., 22485. (Tnx Josh..Ed.)

We have quite a few software and book reviews to do, and I doubt if they all get done before press time! First, I will expand on the two software packages received late last month. I have had a chance to try them out and thoroughly enjoyed them.

They were Graphics Kit ($14.95) & Programmers Toolkit ($14.95) available from Softsync, Inc., P.O. Box 480, Murray Hill Station, N.Y., N.Y., 10156. We are grateful to them for sending the software for review. Fortunately the review is 'favorable'; I don't enjoy writing unfavorable ones on those donated or loaned from the supplier! I will try my best to be objective and honest and I encourage rebuttals or additional inputs from each of you.

Please refer to last month's issue for the initial comments on these programs and I will simply add to them. These programs can be used alone or together and occupy a little over 2K above RAMTOP. The loading procedure has to be followed closely and the programs are 'self-starting'. Worried about my recorder 'eating' the original tape, I tried to BREAK and SAVE them on another tape. The self-starting procedure prevents this, so I simply used two recorders and the Radio Shack attenuator cable and did a recorder-to-recorder copy without any problems. That was an almost impossible feat for TRS-80 tapes! Here's a rundown of the 23 machine code routines provided by Graphics Kit. UP, DOWN, LEFT, RIGHT - alter the position at which your next character will be printed. A line such as: RAND USR 31203, for example, moves the cursor left. EDITPRINT - changes the current print position to line 23 of your screen (bottom). UPSCROLL, DOWNSCROLL, RIGHTSCROLL, LEFTSCROLL - these scroll the entire screen display, with wraparound. Neat for business window displays, etc. ONSCREEN, OFFSCREEN - turn your screen display on/off (white screen), similar to FAST mode, but it does not use the FAST mode to do it. BACKGROUND ON, BACKGROUND OFF - provide a neat background for your display. You specify the desired character by POKE 31741,(desired char) then use the RAND USR statement. FOREGROUND ON, FOREGROUND OFF - is a bit difficult to describe. It generally protects all characters that were on the screen at the time ON was executed. You have to see the worm crawl behind the cactus to appreciate this one. BORDER, UNBORDER - is similar to the background mode except that only a border character is drawn. FILL - allows you to fill a specified part of the display with a selected character. It does entire lines. REVERSE - changes specified lines into reverse video. Kinda neat. DRAW, UNDRAW - is a complicated but powerful command. First, you create your graphics characters in a REM with <, >, A, V separating each character. This indicates which direction the next character is placed with respect to the previous one. You can have numerous REM's with different characters. Then you POKE 31736, (line number of desired REM) and then use the RAND USR commands. SEARCH/REPLACE - allows you to search the screen display for any desired character and replace it with another. SQUARE - draws a square or rectangle to your specifications. No, it does not have a circle command! An error code summary is given to help you figure out the errors you will undoubtedly make. That's about it. The documention consists of seven 'mini-pages' with brief descriptions of each command. Now for the good news, there is a DEMO program provided and you can load it and watch Graphics Kit do its thing! I highly recommend this software for those of you wanting to impress the world with neat graphics. I think thats a lot of 'power' for 2K of machine code and think its worth the asking price. Watching the neat DEMO program would sell you on it immediately.

The next one, Programmers Toolkit is not quite as 'powerful', providing eight useful routines. It does the following: RENUMBER - renumbers your program lines with the limitations that all GOTO's and GOSUBS must have a four digit line

number to begin with (ex. ØØ95). Computed GOTO and GOSUB's have to be done manually, and the maximum number of lines it can handle is 9999. SEARCH & REPLACE - allows you to change any/all occurrances of a specified code (character) in your program to another code. SEARCH & LIST - searchs and lists all lines having a specified code. HYPER GRAPHICS MODE - alters the start address of the character table. I haven't figured this one out yet. FILL - allows you to fill the next print line(s) on your screen to a specified character. REVERSE - allows you to reverse video the next print line(s) on your screen. WAIT - creates a program 'hold' condition until an input is received from the cassette recorder, and then automatically returns to the BASIC program. And finally, FREE- which simply tells how many bytes of free memory remains. The documentation is 6 mini-pages with small 10-liners for demonstration programs. No DEMO program is on the tape. I liked this 'program' but think it is priced a bit high. If I could only afford one of the two, I would definitely buy the Graphics Kit. It is a handy addition though.

Remaining to be reviewed next time is The ZX-81 Pocket Book, The Sinclair ZX-81 - programming for real applications, Mastering Machine Code on your ZX-81, ZXAS assembler, ZXDB disassembler, and the Byte-Back 64-K memory kit. Initial impressions: ZXAS has no assembler directives as such, hence has no provisions for entering non-instruction code (DATA tables) and I consider it USELESS for a LOT of applications. Am I wrong? ZXDB has no provisions for tape storage/retrieval of code. The nice (and usually long) program you hand-entered is lost after you get it debugged. Any ideas? The Byte-Back 64K card looks nice and I am busily building it. Initial contacts with the company were very favorable, and they are willing to sell the hard to find parts. However, unless you have a very economical source of the MCM 6664 or MCM 6665 64K RAM chips, their very reasonable kit price is going to be hard to beat. More details next month.

QZX Friends

Here's your chance to let your ambitions and accomplishments be known. Feel free to let us know what you are up to, and to contact those 'doing your thing'.

W4MHQ - Josh (see his reviews this issue) is a project engineer for the Navy at the computer engineering branch of the Naval Surface Weapons Center at Dahlgren, Va. He's also into photography & sports car racing. He's working on a TRS-80/ZX-81 interface (me too..Ed.)

KAØOOQ - G (name?-) has been a ZX-81 user for two years. He uses it, 16K RAM, a printer, and the NU4V CWSS program to work the novice bands at 20-40 WPM!

WDØFHK - Phillip has a 1K ZX-81 which he is programming for RTTY using a program in QST. He is working on a demodulator from Sept '81 QST.

K9GJU - Rich has both a ZX8Ø & ZX81 (with 16K). He says that an article he read in 8Ø US magazine (Nov. '82, pg. 48) implies that the Hayes Smartmodem could be used as an interface for RTTY. (OK??)

KB8WO - Paul has an 81 with 16K and is a former QZX member. He is interested in modem designs and CW terminal uses. As the assistant director of the Instructional Media Center of Capital University in Columbus, Ohio he is considering using ZX81's for student checkout units. (Good idea, hope they remember to check them back in..Ed.)

W3ZQN - Bob has been a ham since 1954 and is a CW hound with a Ten Tec Century 121. He hopes to attach his 81 which he built from a kit. He is working on a DXCC list program.

WA1LOU - Stan, who conducts the QST 'On Line' column sent a nice note. (Thanks for the publicity..Ed.)

WA2RUW - J.C. has a 'slightly used' 81 and is looking for ways to interface it with his Icom 251A especially for RTTY & CW.

WB2EVF - Bob has a ZX-81 & TS-1ØØ2. (Hooked in series or parallel?..Ed.)

WA2KZD - Tim has already sent in a change of address with his future issues going to the NOAA ship

Davidson. (Do we use air or surface mail to reach him? .Ed..)

KA5IBC - Carl as many others did, received a TS1000 for XMAS. He is a novice and hopes to use his computer for improving his CW.

K4MLR - Bob has an 81 with 16K which seems to be the most popular combination.

KE6CZ - Gary has been a ham for 5 years and uses a TS-530 with a 140 foot longwire 10 feet off the ground. (Watch out for wandering giraffes!..Ed.) He has WAS on CW and has a TS1000 with a Memotech 16K RAM which he claims does not have the 'wobble' problem of the Sinclair RAM units.

WB5HVS - Roy has an 81 with 16K which he is using for Morse code with a combination of NU4V's receive program and K2MI's transmit program. He is currently building a demodulator for RTTY. He gave his extra copy of QZX (we goofed) to K5SVC (who hopefully will subscribe).

KG9Z - Scott has an 81 expanded with 16K, big keyboard, and metal case. No interference either way when using it with his ham rig. He has exposure to the Apple, HP85 and VIC-20 too. (Wonder which he likes best?..Ed.) His XYL is KA9JLD.

QZX Net Info

QZX Net Report

by Russ Parker - W9CQD

One of the unique things about hobbies is the fun of finding others with the same interests. Talking with these people enables us to enjoy the hobby all the more. It is also an avenue to compare notes, submit problems, and help others find solutions to their problems. Ham radio allows us to find Sinclair users across the country to share our knowledge. The QZX net on twenty meters, (14.345 MHz, Wednesdays, at 9 PM EST) is doing a great job. Propagation willing, and your continued support will keep it alive.

There is still a great deal of interest in establishing more forty meter nets. I would like to hear from people who can act as NCS and start some nets on forty in the evening, weekends, or whatever. The newsletter will gladly publish dates & times. Forty meters could fill in some of the gaps. I'm looking forward to talking to more Sinclair users in the near future. (Tnx very much Russ..Ed)

Net announcement - N3CHT reports that he is running a two meter net with KB3YT on 146.04/.64 in the Pittsburgh, Greenburg, Johnstown area of Pennsylvania. It meets every Wednesday at 9 PM local time. (I'm still listening for skip out here in N.Mex..Ed.)

Hints & Kinks

This column will try to track and document the quirks, fixes, and unique modifications done to the Sinclair computers. If you have a suggestion for a more original column title let me know. I hate to snitch the good ol' ARRL title! We will occasionally, when news is slow, print a cumulative list of whats been reported. Let's hear from you. Remember I am new with a ZX-81, and we will have many more new subscribers that are not familiar with whats already been done and reported.

Here's what we have this month:

6. Is your interface connector causing intermittents? Keep after it with an eraser and alcohol but don't get ideas about putting a nice new layer of solder on it! First, its hard to get a uniformly thick layer on it, causing the connector fingers not to make good contact. The solder oxidizes with time and the problem is worse than ever. I am investigating the availability of 'Goldplugs' which solved my problems on my TRSE0 and on use of a small gold electroplating tool that's supposed to work. Reports next month. (from W4GHV, better known as ..Ed.)

7. The 16K RAM causes a lot of troubles for many users. Use hint above if necessary. W5RRP found a grounding spring loose in his RAM pack and also a bypass cap with one side unsoldered. Remaining intermittents were solved by putting a piece of Velcro between the upper back surface of the computer at the connector PC board and a matching

piece on the RAM module so that the module is held partly disengaged. (from W5RRP)

8. KA9HRH reports that he brought a keyboard at a local hamfest with a double sided PC board. The problem was how to cut the copper on the inner side of the board under the switches without removing them. He used the high current from a battery to BURN off the copper. He reported a glow and some smoke but got the open circuits he needed to make use of the keyboard! (Only a ham would have that much ingenuity! Hope he didn't accidently push a key when the battery was doing its thing..Ed.)

9. W3ZQN broke the conductive foil near the computer end of his keyboard leads while working on his 81. His solution was to use a pair of scissors to trim the ends past the break. He also cooled his computer off a bit by placing two silicon diodes in series with the input to the 5 volt regulator to lower the voltage going into the regulator by about 1.4 volts.

10. KC40C has sucessfully modified the MiniMUF program from Dec '82 QST for his ZX81 with 16K. He changed lines 1 to 680 to the ZX81 format and also changed the last part of line 1210 to read (1-(C*C)) to prevent trouble with possible negative coordinates. Due to machine differences he changed all occurrences of data names T5 to T, all T to T5, all K1 to K, all K to K1. (Huh?) Adding a line 655 he used a rounding formula which he took from Syntax 12/82, giving: 655 LET J9=INT((J9+.5/1E1)*1E1)/1E1

11. Having TVI (television interferance) problems with the 81? Adding peripherals or memory usually increases the problems which can sometimes be improved by shielding the antenna switch. Cover it with aluminum foil insuring contact with the shield of the cable going to the computer. (From K5XY)

Miscellaneous Comments

I came across a review of Flight Simulation, available from Sinclair, in the January 1983 issue of Microcomputing (Kilobaud). It gave a very favorable review of this game and has me anxious to try it. I wonder if any of the QZX 'gang' has enjoyed it. A similar game for the TRS-80 was both enjoyable to a point and very incomplete and disappointing. I flew right through the hanger, ran out of fuel, and took off again; all without any warning!

Trying to keep up with Sinclair's assembly line are the number of companies providing software, hardware, etc for the Sinclair/Timex computers. The list is growing daily. We have prepared a mailing list of over 100 to which we send info on QZX in hopes they will advertise with us. If you are interested in the products they may have to offer and are lazy, see the ad in the Unclassified column. You could get a bunch of 'penny postcards', slap two labels on them, write 'Please send catalog or info on your products' and hopefully get responses from them. Sure wish more of them would respond to our prods for advertising! Mention us when you can

The latest word we have from Margarta Bruzelius, Executive Vice President for the U.S. Operations of Sinclair Research Ltd., is that it was uncertain when the Spectrum, the new color computer developed by Sinclair, would be introduced into the U.S. She said that there were 'complex agreements made with Timex' to be considered. Also there is a tremendous demand for the Spectrum in the United Kingdom (more than 30,000 sold in just 3 months) which would have to be satisfied before the computer could be introduced here.

According to Daniel Ross, Vice President of Operations, Timex Computer Corporation, Timex is producing one computer every TEN SECONDS to fulfill the demand for the Timex TS-1000. (Wonder if they mean 24 hours/day 7 days/wk? ..Ed). A Timex printer with 40 columns on thermal paper should be available

in the first quarter of ... is a MODEM with automatic dial answer capabilities for less than $100.

Other rumors floating around indicate that there will be a price drop for the TS-1000 soon. I have already seen them discounted down to $85.

Program Submission - There's gotta be a better way! I realize the small printers are neat, and economical and we will continue to gladly take ALL the programs you submit. Here's some alternatives to eliminate the hours I spend cutting and pasting. YOU cut and paste them to fit easily within a 3.5 x 10 inch area. Better yet, submit them on a tape (2 copies) and we will print them on a large printer we are presently trying to interface. We will extend your subscription 2 issues (assuming the tape is worth $2), and keep/re-use the tape to save on return postage. If you would like to sell (at REASONABLE prices) a tape of your program, so state it in the article. We are trying to come up with a reasonable decision concerning printing LONG programs, providing tapes or listings at extra cost, or letting you provide them. What's your opinion?

```
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QZX presents the best software and hardware projects available for the radio amateur. While the contents are believed to be accurate, no warranty is extended on any program or project. No investigation has been made of the claims or reputation of any advertiser. It would be greatly appreciated if all correspondance requiring an answer would be accompanied by a self-stamped envelope (SASE). Copyright by QZX, 1982. All rights reserved, Photocopying by permission only.

ZX81 - TS1000

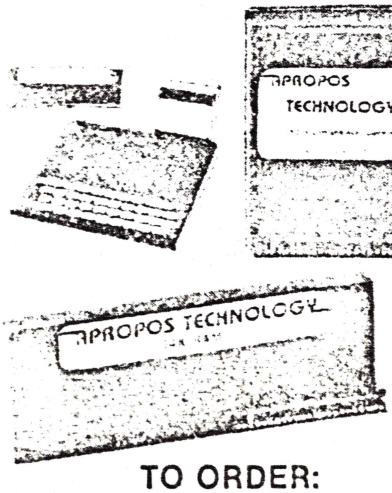
SOFTWARE

DR. FLOYD
Psychoanalysis by computer? - well, not quite but Dr. Floyd will carry on a conversation with you using psychoanalytic techniques giving the appearance of artificial intelligence. Requires 16K RAM. $10.95

GRAPHICS PAC I
An introduction to Sinclair graphics - includes a 1K Line Doodler, a 16K Super Line Doodler, several random drawing programs and a Screen Formatter. Kids will love all of them. The screen formatter will satisfy serious programmers. Requires 16K for full use but simpler sections will run with 1 or 2K. $10.95

WORD PLAY
Fun with words - 2 jargon generating programs for grown ups, 2 story writers for children and a bonus secret message program. Requires 16K. $9.95

All software is on high quality cassettes and is replacement guaranteed.



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HARDWARE

$45.95 SIN16 16K RAM
This RAM plug-in allows the user to run virtually all programs written for the ZX81 or TS1000. Completely assembled & tested

$135.95 SUPER SIN64 64K RAM
This is the maximum directly addressable RAM that your ZX81 or TS1000 can use - Memory is used as follows: 0-8K Sinclair operating ROM. 8-16K switches in or out of use. Used for assembly language routines, memory mapped peripherals. Contents are safe from NEW and cassette (disc) loads thus allowing program-to-program communications. 16-32K BASIC and assembly language user program area. 32-64K large data arrays & BASIC variables.

All hardware is completely compatable with Sinclair add-on products. Both RAMS use the most reliable gold plated, bifurcated contact connector on the market.

10 day return privilege on all hardware-90 day parts and labor warranty-inexpensive extended service contract is available-
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